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Abstract

This paper describes broad course goals for IDS308 Educational Technologies and Techniques of Communication (ETTC) and two technology-related simulation activities intended to promote active learning and critical thinking. Centered on active engagement, real-world applications, and the promotion of an audience-oriented approach to presentation design, the course aims to provide future teachers with an understanding of how and when technology can be used to promote communication, and why a shift in attitude and perspective is important during the transition from "college student" to "professional."

Keywords: active learning, critical thinking, pedagogy, simulation, student engagement, technology

Introduction

Active learning and critical thinking have been at the core of Miyazaki International College's (MIC) approach to education since its founding in 1994. When MIC was awarded MEXT's University Reform Acceleration Program (AP) grant in 2014, the institution began to examine active learning pedagogy and critical thinking development more closely throughout the institution's various programs. In this spirit, the current paper describes two simulation activities in which active learning and critical thinking mesh with course goals in IDS308 Educational Technologies and Techniques of Communication (ETTC), a 3rd year interdisciplinary studies course in MIC's School of International Liberal Arts. Although not a direct product of the AP Grant, this class has been structured around principles that align well with the grant's objectives. Centered on active engagement, real-world applications, and the promotion of an audience-oriented approach to presentation design, the course aims to provide future teachers with an understanding of how and when technology can be used to promote communication, and why a shift in attitude and perspective is important during the transition from "college student" to "professional."

De-emphasizing Technology in a Technology Course

Although ETTC is ostensibly a technology course, the detailed coverage of specific technologies has less priority in the classroom than the development of the reasoning skills necessary to match technologies to the needs of a given enterprise. The course has two overarching curricular goals: 1) to expose students to a range of technologies that may be of use to them in careers in either education or business and 2) to raise awareness of technical, visual design, and performance factors that can contribute to the effective communication of ideas. These goals are achieved through practical lessons like technology orientations and presenter development exercises (both technique and evaluation) as well as through coverage of more abstract material like educational standards, design principles, lesson planning, and administrative/pedagogical simulations. The selection of course content can vary somewhat from semester to semester as emphasis shifts with students' interests and needs, but the overall curricular goals remain consistent.

In meeting the first goal, the most engaging and relevant lessons are the technology orientations. Students learn about the pros and cons of various “classroom” technologies such as video screens, interface devices (including electronic whiteboards and touch pen interfaces), video cameras, microphones, classical OHPs (overhead projectors), document cameras, and computer projectors. They learn not only how to operate these devices but, more crucially, how to best deploy these technologies in a given presentation situation based on the characteristics of the venue and the needs of the activity. For example, they learn how large a projected image should be for a given number of viewers in a room of a particular size; how to troubleshoot common problems associated with these technologies; and how the strengths and limitations of the technology can impact the kind of interaction a presenter can expect from the audience.

However, the amount of time spent on these orientations is relatively small. Instead, the focus for students in ETTC is on understanding and addressing the *functionality* provided by various technologies in the classroom. Notions like Moore’s Law, the observation that computing power doubles approximately once every two years (Moore, 1965), make it clear that technology advances far too quickly to make the nuts-and-bolts mastery of any given technology an efficient proposition. In fact, considering that students in ETTC will remain in school for at least another full year, it is difficult to predict what new technologies will have evolved and what old technologies will have been rendered obsolete by the time students graduate and enter the work force. Thus, by emphasizing how to think critically about learning about using technology, they are set up for greater, more universal success in our rapidly evolving world.

When MIC was founded in 1994, for example, overhead projectors (OHPs) were a basic and ubiquitous piece of classroom hardware. Since then, OHPs have gradually been almost completely phased out in favor of computer projectors which offer a comparable basic functionality to the classroom (displaying a large image to a group of people). Obviously, computer projectors can do more than just project a static image, but they represent the advance and evolution of a device that fulfills a specific pedagogical need. It would not be an efficient use of valuable class time for students to receive extensive training in the use of OHPs when these machines are likely to be unavailable or antiquated in a modern work situation. Conversely, a great deal of time spent on the latest model of computer projector could be equally problematic as differences between projector makers, constantly evolving features, and unknown availability throw a heavy dose of unpredictability into the equation.

Thus, while ETTC includes a broad survey of available technologies, more emphasis is placed on the needs of teachers and students (or presenter and audience) as guides to technology implementation planning, rather than allowing equipment availability to dictate what happens in a given presentation. In other words, an available piece of technology should not be used simply because it is on hand but because it is deemed to be the most effective means to achieve an objective. The positive effects of computer technology on learning — such as retention, motivation, and engagement value

— are obvious (Cox, 2015; Smaldino et el., 2015), but there are those who caution against thinking of classroom technology use as guaranteeing academic success (Bowen, 2012; Bowen, 2015; Canning-Wilson, 2000; Smaldino et el., 2015; Walker, 2015). By emphasizing pedagogical needs over the presence of the technology itself, ETTC tries to help students to recognize and avoid this pitfall.

Therefore, the second of the two overall objectives — raising awareness of visual design, technical, and performance factors that can contribute to the effective communication of ideas — is addressed in the context of presenter/audience needs. For example, how can various categories of technology facilitate different kinds of activities? How does visual design help a class/audience to more effectively understand the message? How can the way that technology is used affect participation and comprehension?

This is where the strengths of active learning and critical thinking in the classroom become most important for ETTC. It is one thing to know *how* to connect and use an HDMI document projector, but another thing entirely to know *when* to use it (or not). As Koehler and Mishra (2009) point out in their description of the TPACK (technology, pedagogy, and content knowledge) framework, "teaching is a complicated practice that requires an interweaving of many kinds of specialized knowledge" (p. 2). An understanding of the technology itself is only one component of what needs to be a much richer communication experience.

A Broader Understanding

There is a third goal in ETTC that is corollary to the other two but which is a step beyond: to promote an awareness of the application of technology from the standpoint of a teacher or administrator. To give students a chance to assume responsibility for technology use decisions, and to blend that with the first two course goals, simulations have been extremely useful. They help students to develop sensitivity to important factors in decision making that may be far beyond their own experiences and do so in a way that is engaging, cooperative, and competitive. The next sections will describe two simulations used in class, how they were used to promote student engagement and critical thinking, and student responses to the activities.

Simulation Activity 1: Founder's Day Problem-Solving Simulation

In this simulation, students are asked to find a way for a single presenter with a PowerPoint presentation to be seen simultaneously by audiences in two separate rooms on the 1st and 3rd floors of MIC's Building 2. The task seems straightforward but is deceptively complex. It requires students to propose a solution to a problem that a teacher might easily encounter but one that most students would find to be novel. Figure 1 illustrates the situation. There is no internal infrastructure that connects the media capabilities of the two rooms. While there is a built-in computer projector in the 3rd floor room, there is no AV equipment pre-installed in the 1st floor room at all. Students are informed that Wi-Fi is available throughout the building but that signal strength is not perfectly reliable and prone to brief interruptions.

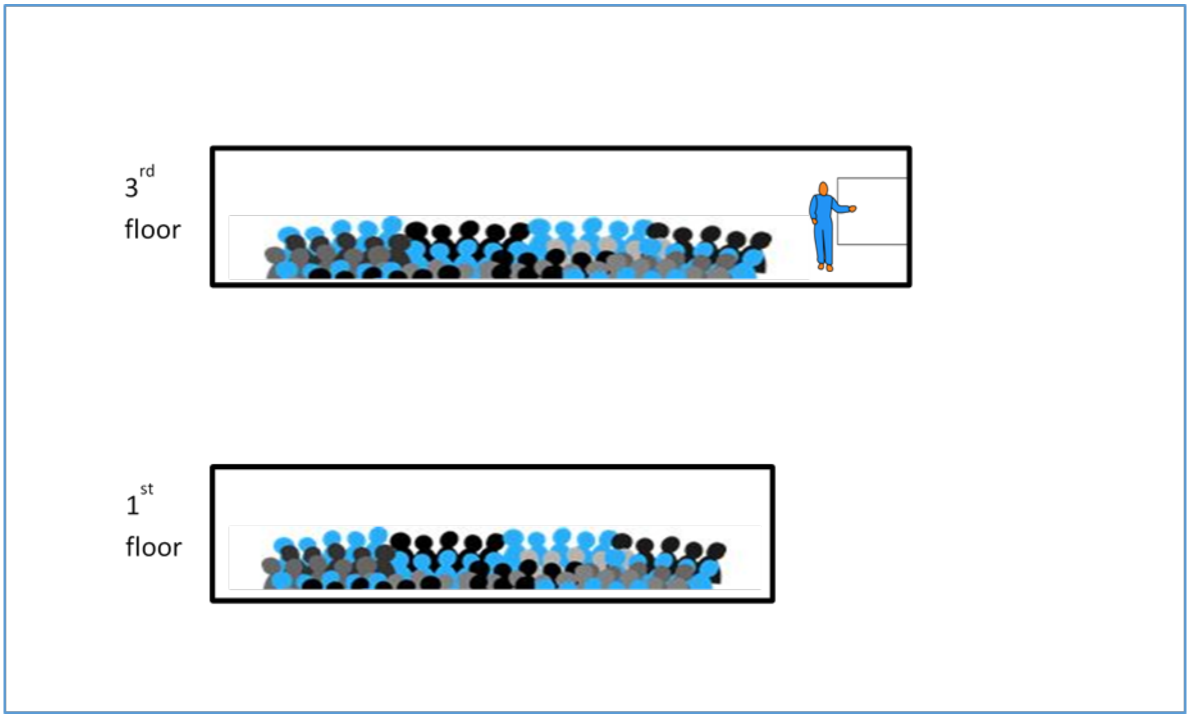

Figure 1. The problem in Simulation 1.

To solve the problem, students are encouraged to explore the advantages and drawbacks of various technologies that might resolve the situation. Some of the variables include room capacity, audio/video transmission, image size, computer synchronization, screen size, sound volume, tech management (human crew), audience placement/arrangement, venue, Wi-Fi reliability, and software options. Secondary considerations include cable management, inclement weather procedures, and reliable socket fastening.

The critical thinking aspect of the task requires that the student groups consider several different viewpoints simultaneously: presenter, 3rd floor audience, 1st floor audience, 3rd floor crew, 1st floor crew, and the 3rd floor moderator. Additionally, they need to become familiar with the capabilities of various available resources, weigh these against one another, and propose a viable solution that will be judged against the proposals of other groups.

Student uniformly respond well to this task as it is very concrete and the scenario for the simulation is familiar enough that they can use their prior knowledge of the campus and the buildings to recommend solutions. Groups almost always initially suggest moving the activity to a venue large enough to accommodate all the participants in a single room. This is a good suggestion and well-worth considering. However, it is not without its own problems. The greater distance between the speaker and the audience would make it somewhat harder for people in the back to see either the speaker or the accompanying PowerPoint presentation without some additional measures being taken. In this case, an understanding of standard projection viewing distances as described by Smaldino (2001) helps students to determine whether the available resources are adequate for a larger room. While moving to a larger room is a good suggestion, it just sidesteps the problem. The real creativity comes when this option is removed. Once told that the venue must remain split as initially described, the groups' ideas start to become much more resourceful.

Sometimes groups consider online options such as Skype or live-streaming to get a video signal from one room to the other. Unfortunately, while this is also a good idea, students often do not consider the possibility of Wi-Fi signal loss or other circumstances that could result in Internet service interruption. While wireless connectivity is becoming generally more reliable, it is certainly true that problems still occur from time to time and a dropped signal during a live event can mean disaster. All in all, with no easy means to recover from a dropped connection, the Internet option is less than ideal.

Another student suggestion is to record the speech in the primary room and show the video to the secondary room later. This solution has the drawback of requiring a delay between the two rooms. Since the presentation fills the entire time allotted on the campus schedule, there is not enough time to play the recorded presentation before classes resume.

A third common idea is to use a very long cable to connect a video camera in the primary room to a television in the secondary room by feeding it out the window, down the side of the building, and in through an open window. This comes with its own complications, but students are usually able to provide concrete ideas about how to make their suggestion work. One of the difficulties is that the presenter uses a PowerPoint presentation to illustrate his talk. While it is certainly possible to use a video camera to capture the image of both the speaker and the PowerPoint screen and then broadcast that to the other room. Doing so causes the screen text to become far too small to be legible. In a recent class, this limitation was identified by students in a group discussion. Subsequently, they renewed their efforts to brainstorm practical alternatives. Their final idea was to have the PowerPoint computer equipped with two monitor outputs. One monitor output would go to the computer projector in the first room and the other to the projector in the second room. The actual presenter would be the focus of a camera feed from room one to room two. This is illustrated in Figure 2.

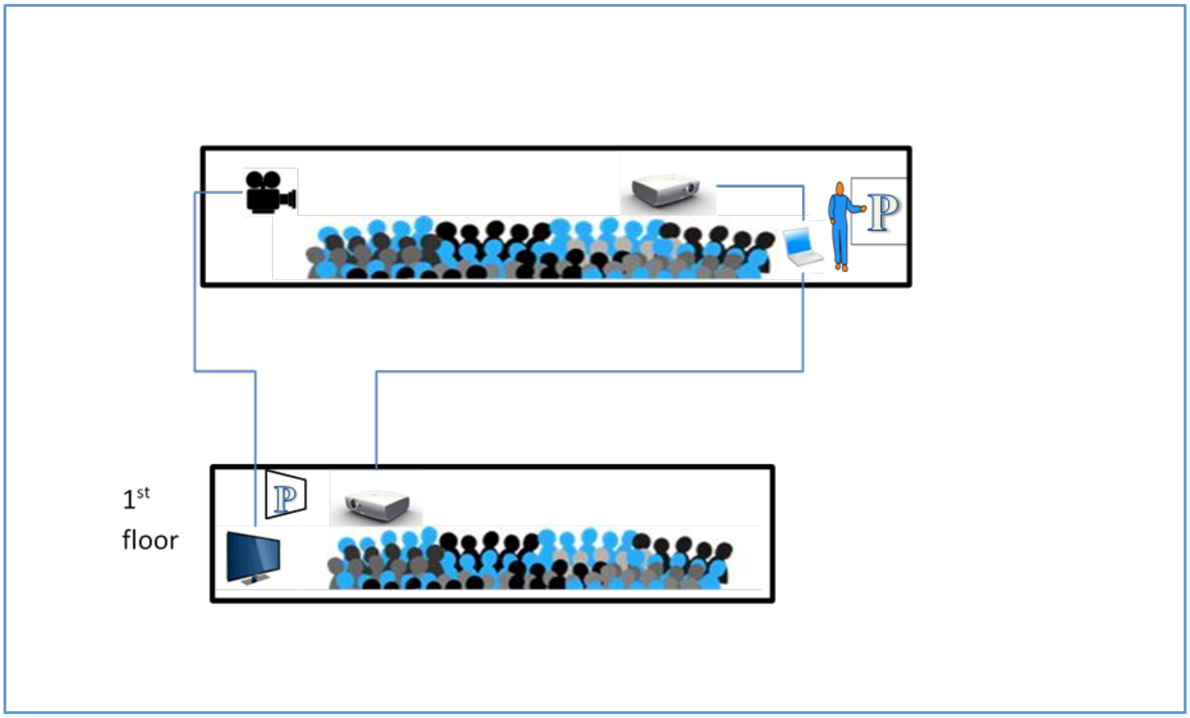

Figure 2. Student Solution to Simulation 1.

This solution is remarkably close to the solution that was used in the real-world event upon which the simulation was based. The only difference was that the PowerPoint presentation in the primary room was shown normally on a single screen. Instead of stringing an additional cable out of the window, a second person was seated in room two with a separate computer and projector. That person would click through the presentation along with the primary presenter. It is likely that the only reason the students did not think of this arrangement is that they were looking for a technological solution rather than a staffing one. Since they were not told that additional people were available to help staff the even, I do not take this to be a fault in their proposal.

As I said before this activity is very concrete and allows students to draw on their prior knowledge to solve a real-world problem. They exercise creativity in their search for solutions and must conduct research into the capabilities of the technologies that they have at their disposal (e.g. streaming applications) to facilitate the success of the event.

Simulation Activity 2: Computing Resources

Unlike the equipment deployment scenario of Simulation Activity 1, Simulation Activity 2 focuses on the more abstract task of administrative planning using a real-world challenge as the basis for its scenario. Students assume the role of teachers in a school (i.e. MIC) that is looking to purchase computer equipment to support the academic program for the next few years. The choices under consideration are desktop computer labs, laptop computer labs, institutionally-owned tablet computers, student-owned tablet computers, student-owned laptop computers, or any other scheme that meets the computing needs of students, faculty, and administration. Student groups must research and consider the pros and cons of the various options, make a proposal, and defend the proposal against counter-proposals from other groups. In this simulation, the factors requiring consideration are much broader than in the first simulation and include cost to the institution, cost to the student, portability, security, convenience, the devices' base capabilities, expandability/updatability, warranties, built-in obsolescence, software availability, ease of use, responsibility for loss/damage/theft, and pedagogy. In addition, students were instructed to use case studies in their arguments by looking at ways that other institutions utilize their own computing resources.

Students create PowerPoint presentations to accompany the formal explanation of their proposals. Each proposal is videotaped and is followed by a period of Q&A from the other groups. This phase of the exercise can result in lively debate as groups compare their ideas with those of others. The PowerPoint presentations are put onto the class Moodle page for reference and feedback, and the video recordings of the presentations are shared via Google Drive. The students evaluate their presentations as individuals and as a group and provide feedback to other groups to help them improve their own presentation skills. This feedback is guided by self-created presentation rubrics that students draft at the beginning of the ETTC course.

One of the interesting outcomes of this activity was that it underscores students' inexperience in planning for a context of responsibility larger than their own immediate needs. It also helped to hint at their transition from thinking like students to their thinking like institutional decision-makers. As students, their concerns revolved around factors such as cost to the student, portability, and convenience. They came to see a greater breadth of issues impacting their more complex macro environment.

For example, one group's suggestion was to allow students without computers at home to remove computers from a laptop lab for use outside of school. Clearly the intent here was to allow students who do not have the money for their own computer to use a school computer at home. From the students' point of view, this was a cost-effective and useful policy that addressed a student concern. It did not, however, meet the needs of the faculty. The group did not initially consider the fact that allowing students to remove computers from a designated computer lab could be a problem for scheduled classes the following day if the equipment was not returned promptly (a pedagogical concern). It is interesting to note that even after this drawback was raised, suggestions intended to correct the flaw (such as imposing penalties for tardy returns) did not address the problem of how to cope with a room that suddenly had too few computers for a full class of students. Similarly, a group that had suggested that students bring their own tablet computers to school did not include a contingency plan for students whose tablets were broken, lost, stolen, or simply forgotten.

It helps to focus discussion by reminding students that simply purchasing technology resources does little to support the program unless the purchases meet academic needs. Cast in this light, certain options become more viable than others, but regardless of which option is deemed the "winner," the following needs seem to earn top priority from year to year:

- the ability to run Microsoft Office or equivalent
- the ability to browse the Internet
- the ability to store and transfer data easily
- low cost
- portability

In addition, the ability to customize the selection of software on the device was seen to be highly desirable. However, given a choice between pre-configured, institutionally-owned devices and customizable, student-purchased devices, students seemed to be more interested in saving money. Conversely, the notion that institutionally-owned devices would ultimately result in the school being responsible for a large amount of obsolete technology years in the future (an administrative concern) has not been raised by any group of students to date. Clearly, developing the ability to understand a range of perspectives, both demographically and temporally, is a crucial skill, which we will continue to emphasize in the ETTC classroom and beyond.

Conclusions

Together, these two simulations seek to engage students in activities which require them to think creatively, consider opposing viewpoints, prepare persuasive arguments, construct effective displays of visual information, prepare verbal and written explanations of a proposal, evaluate proposals for strengths and flaws, monitor and evaluate their development as presenters, and consider problems that are beyond the scope of their own experiences. Through activities such as these, students blend all the broad goals of the ETTC as they compete with other groups and begin to think of simple problems for technology use from a broader, deeper, and more professional point of view.

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